



SigFig Investment Management Methodology

Introduction

SigFig manages your investments for you. We combine our expertise in spotting portfolio issues with insights from our team's 60 years of quantitative portfolio management. SigFig offers a simple way for you to take advantage of Nobel-prize winning portfolio and asset research (Markowitz and Sharpe: 1990 Nobel; Fama: 2013 Nobel) that enables you to create a portfolio tailored to your specific personal investment goals. You can find the portfolio that's right for you, customized to your financial goals and balanced to help protect you against market uncertainty.

Many people don't have the time to manage their investment portfolio the way that they should. It's troublesome to log into many different accounts to see how your funds are doing. Evaluating all the options available when it's time to rebalance your portfolio and investing your money into different assets without guidance can be daunting. SigFig steps into this space—we're here to simplify your life by monitoring and managing your investment portfolio for you, at a low cost and with high quality.

Our investment methodology is grounded on a rigorously researched portfolio management framework:

1. Identify the asset classes that contribute to a well-balanced portfolio;
2. Select investment vehicles that provide the best balance of market coverage at low cost;
3. Create portfolios matched to a range of risk tolerance through Modern Portfolio Theory techniques;
4. Understand your risk preferences to create a portfolio that is tailored for you;
5. Monitor and rebalance your portfolio to stay on track.

This paper outlines the details of what we do at a high level and also explains in more technical terms what goes on 'under the hood'.



1. The Asset Classes

Most of us have heard about the fundamental tradeoff between risk and return—that notion that you should only expect better returns by taking on more risk. If you want less risk, a safer portfolio will likely result in lower returns. If you've spent time investing in the market, you've probably heard that diversifying your portfolio is smart, but you might wonder why you should.

Briefly, the returns you earn on your portfolio are a weighted average of the returns of the components in your portfolio. If you have 30% of your money in Asset A and 70% of your money in Asset B, then your portfolio's return comes 30% from Asset A and 70% from Asset B. If Asset A provides higher returns, you could increase your portfolio returns by putting a greater percentage of your money in Asset A.

Interestingly, risk does not work the same way. Instead, while portfolio risk is also a combination of the riskiness of the components, it's also a function of the relationship between the assets in the portfolio. Because the assets don't always move together in exactly the same way, they can occasionally counteract each other, which reduces the variability in their combined returns; i.e., it reduces the portfolio's riskiness. That's the advantage of diversification; by holding several different assets at once, you can lower your exposure to risk.

Most academic research suggests that it's very difficult to pick individual securities and consistently beat the market. The Efficient Market Hypothesis offers a reason; there is a lot of competition among the market participants (for example, regular investors, mutual fund managers, hedge funds) who are all trying to spot securities that are over- or under-valued, and this competition tends to make it difficult for ordinary investors to beat the market's return. (For an in-depth analysis of this research, see Fama's (1991) review, *Efficient Capital Markets: II*). The key takeaway is that the average investor usually struggles to beat an index composed of all the assets in the market.

Not only is it difficult to pick individual securities and outperform the market consistently, the impact of security selection is less important than you might realize. Several studies (Brinson, Hood, and Beebower (1986); Brinson, Singer, and Beebower (1991); and Ibbotson and Kaplan (2000)) examined the returns of expertly chosen portfolios (usually mutual funds) to determine the source of portfolio performance. These papers asked a fundamental portfolio management question: which matters more: picking the individual securities within an asset class, or the asset class as a whole? The surprising answer is that the differences in the individual securities chosen by the experts accounted for just 10 percent of the variation in their returns. The overwhelming contributor to performance was the choice of asset class; picking whole asset types, like choosing between stocks or bonds, matters a lot more than picking the particular stocks or bonds. This is because many securities within a class move similarly. When the stock market is up, lots of stocks are up; when the bond market falls, lots of bonds lose value, and vice versa. Coupled with the efficient market hypothesis notion that it's really hard to know beforehand which particular securities will do well or poorly, the takeaway is that it's much more important to consider how you allocate your money between the asset classes, because that's the largest driver of the portfolio's performance.

We meticulously research asset class options to understand their performance in different market and economic conditions with particular focus on class returns, volatility, and correlation among the classes. For example, stocks are a commonly held asset class, but have substantial year-to-year volatility; historically, the U.S. stock market has provided gains over the long-term, but over shorter horizons they've had periods of declines and gains. Because their performance varies significantly from year to year, stocks are considered a riskier asset. It's this variability in returns that is the hallmark of risk. Investment-grade bonds, on the other hand, tend to provide much lower reward to investors, but these returns are much less volatile; that is, they're less risky.



The Asset Classes

U.S. Stocks

Market-weighted blend of large and small companies

Developed Markets (non-US) Stocks

Typically developed European and Japanese companies

Emerging Markets Stocks

Typically non-developed foreign country companies

Real Estate

Broad coverage of real estate investment trusts

U.S. Bonds

Investment grade bonds, including mortgage-backed securities, U.S. Treasuries, and corporate bonds

Treasury Inflation-Protected Securities

TIPS provide investment grade, inflation protected fixed income

Municipals

Debt issued by state and local governments

Emerging Market Sovereign Debt

Bonds issued by non-developed foreign governments typically payable in U.S. dollars

Short-Term U.S. Treasuries

Typically bills, notes, and bonds with less than 3-year maturities

2. The Reason for ETFs

Financial markets are complex, but there is a simple premise to remember. Buyers are looking for undervalued securities (the expected return is high relative to the risk) and sellers hope to unload overvalued securities (the expected return is low relative to the risk). If there are more buyers bidding up

an asset's price, the expected return starts to decrease...until the point where it's fairly valued. At that point, an investor is indifferent to buying or selling because the asset's expected return matches its expected risk; there is no special incentive to trade.

There are millions of professionals trading these assets, pushing their value to "fair" prices, where it's properly valued with expected return matching its expected risk. These markets are so competitive that even professionals struggle to pick securities that will consistently beat the market's return, on average, over the long run (for more details, see Fama (1991)). With assets trading at fair prices and it's nearly impossible for investors to "beat" the market consistently, financial advisors encourage investors to reduce their risks by buying broad-market index funds that focus on buying nearly every security in that asset class. Some of the index funds' underlying holdings will go up, and some will fall, but, on average, your portfolio's performance exactly matches the market's performance, because your portfolio comprises all securities in the market.

Why would you want to buy all of the assets in a class? As discussed earlier, buying multiple securities can reduce an investor's total risk because different assets move in different directions occasionally, reducing the variability in the total portfolio's performance. Some of the risk is diversifiable, asset-specific (e.g., does this stock's company have good management?), while some risk is market-related, applying to all assets in a class. As the investor buys a greater number of assets, he's reducing risk by eliminating the diversifiable, asset-specific risk, but can never escape the market-related risk. It's only this market-related risk that's compensated with the expected return. Thus, if you invest in the market, studies indicate that it is beneficial to diversify across several asset classes through index funds.

Still, it's hard for individual investors to buy all the stocks in the US market; there are several thousand individual stocks that trade in the U.S. stock markets. Companies like Vanguard, iShares, and Schwab create products called Exchange Traded Funds (ETFs) that



allow individual investors to pool their money and buy up the individual securities. When you buy an ETF, you're buying into a collection of all the assets they hold, so you have indirect ownership of all the holdings they have.

We chose the particular ETFs we did because they cover the asset classes well and have low total costs, leaving more money in our clients' accounts. One of these costs, the expense ratio, is the fee an ETF company charges for things like overhead, management, marketing, and profit. Moreover, where possible, we utilize commission-free ETFs offered by our brokerage partners, further reducing the cost to our clients. (The ETFs are usually commission-free if you hold them at least 30 days; we're unlikely to trade more frequently than that.) Making sure that the ETFs we use are competitive on costs means saving more of our clients' money for investing, which could add up to thousands or tens of thousands of dollars over a lifetime.

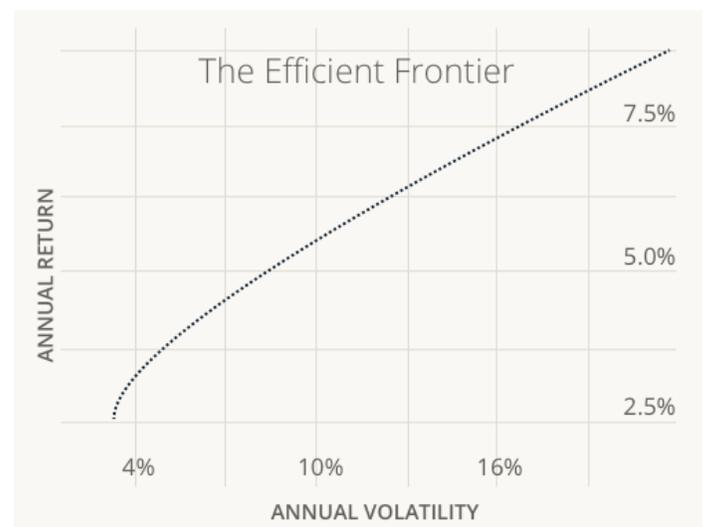
3. Diversification—A Winning Idea

The framework underlying proper financial management began in the 1950s and developed into broader tools for portfolio management called Modern Portfolio Theory (MPT). At its core, portfolio management is about understanding how the mix of assets in a portfolio responds collectively to the market's changes, affecting an investor's desire to increase wealth and reduce risk.

Two economists, Harry Markowitz (1952) and William Sharpe (1964), published a pair of groundbreaking papers that develop the mathematics behind what we understand intuitively—assets like stocks and bonds do not all gain or lose value at the same time. Sometimes one stock goes up, while another falls, and vice versa. Sometimes they might both increase (or decrease) in value, but at different rates. These assets do not have a perfect correlation in their movements. When combined into a single portfolio (a mix of assets), this 'imperfect' correlation reduces the variability in their combined return: this is what we mean by "reduces risk."

Markowitz developed the math that showed how the mix of assets affects the outcome, like adjusting the quantity of ingredients affects the taste and texture of a loaf of bread. There are some combinations of flour, water and yeast that cannot form into a loaf, but there are many combinations that turn out deliciously. While some people prefer bread light and airy, others prefer denser loaves—but the perfect combination depends on the particular preferences of the individual. Markowitz showed that some combinations of asset ingredients result in poor portfolios that don't serve investors well, and more importantly, how to find the mixes that will turn out better. Picking the particular mix that is perfect for the investor depends on the individual's taste for risk.

Finding the set of combinations of good portfolios requires a technique known as mean-variance optimization. The inputs for the equations are the expected performance, variability, and correlation of each asset class based on observations over the last twenty years, weighted towards more recent history. This results in a series of portfolios that have the least risk for various levels of return. Generally, higher returns are accompanied by higher risk. Graphically, the combinations form a curve known as the efficient frontier.



Each point along the efficient frontier represents an optimal combination of the different asset classes at each level of risk. By optimal, we mean that it's the



portfolio designed to give you the maximum amount of return for that amount of risk. If you want a less risky portfolio, move down the line to the left. The combination of assets will be a little different and they'd be expected to generate lower returns because they are safer. Want more return? No problem...move along the curve towards the right, where a riskier combination of assets demands greater tolerance for annual variability.

4. Matching the Portfolio That's Right For You

On the front end, developing a clear understanding of your goals and risk preferences helps us find the best portfolio for you. We ask a short set of questions to develop a more complete understanding of your goals and preferences to balance the riskiness of investing with the expected returns only available through a broadly diversified investment portfolio. Our questions are designed from tested research to identify common threads in the investor preferences for risk. For example, by asking about your age, we can better estimate the length of your investment lifetime and tailor our suggestion specifically to you.

Given your answers, we suggest a portfolio that matches the risk you seem comfortable with. You'll also have a chance to adjust the portfolio by resetting your risk level.

How much risk should you take? Typically, younger investors should lean towards riskier portfolios than older investors, but the reason for this is commonly misunderstood. An older investor has limited time before their earning years are complete, so a poorly timed market downturn could have significant impact on their retirement savings. The younger investor, however, would still have many years of earning power ahead and could adjust their consumption and savings to balance out market downturns early in their investing life. The older you are, the more important it is to secure against market downturns. Nonetheless, other factors could impact your tolerance for risk. For example, a younger investor planning to purchase a house in the next few years may prefer a less risky

portfolio to protect against any short-term variation in their capital.

Our investment suggestions do not change depending on how much money you have to invest. Modern Portfolio Theory is very clear that the amount you have to invest doesn't affect the portfolio choice for you—instead the right portfolio is all about your tolerance for risk, balanced by your need for higher returns. Once satisfied with the portfolio that is the right fit, you can fund your account with a cash transfer from your bank or transfer assets from your existing brokerage. SigFig manages accounts at several widely-used brokers so your assets are safe and SIPC-insured up to \$500,000. It usually takes a few days to transfer the money to your account; then we'll execute trades into the asset class ETFs used by the brokerage partner you chose (each of our partners has a slightly different list of commission-free ETFs they use).

5. Rebalancing—the Not-So-Secret Sauce

Many investment advisors stress the importance of finding the right allocation. It's definitely important to get the initial setup correct to balance your preference for risk and reward. Even if you don't change how you feel about risk, the market does change. The market may push the value of stocks high and bonds low. If you'd invested \$1000 in stocks and \$500 in bonds to start (an initial allocation of 2/3 and 1/3) and the stock market rose 20% while the bond market fell 20%, your portfolio would now be \$1200 in stocks and \$400 in bonds; your allocation would now be 3/4 stock and 1/4 bonds. This is a much riskier portfolio than where you started.

The rebalancing takes care of the deviations from your ideal portfolio by buying when prices are low and selling when prices are high. As the stock market pushes up in value, we sell a little of the stock ETF, locking in your gains. Meanwhile, we'll buy a little of the bond ETF, investing when the prices are low. This is how you buy low and sell high. The whole time, SigFig keeps your account balanced in line with the risk tolerance that you are comfortable with.



Our approach is simple: constantly monitor and adjust your portfolio to the right allocation, lock in your gains when markets are high, and invest when markets are weak. It takes a lot of time and energy to focus on being a good investor. SigFig takes care of the day-to-day monitoring and portfolio rebalancing so you can spend more time doing the things you want to do.

Further Reading

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